Astronomy

ES-2 The student will demonstrate an understanding of the structure and properties of the universe.

ES-2.7 Summarize the life cycles of stars.
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: The life cycle of stars is new material for this course.

It is essential for students to know that the life cycle of a star depends on its mass.

Birth of a Star

- All stars begin their lives as parts of nebulas.
- A protostar is the earliest stage of a star's life.
- A star is born when the contracting gas and dust become so hot that nuclear fusion starts.

Life of a Star

Main-Sequence stars

- The second and longest stage in a main-sequence star's life cycle takes place while the star has an ample supply of hydrogen to fuse into helium;
- When the hydrogen has fused into helium, the core of the star contracts and the outer shell expands greatly; it has become a giant star.

Massive stars

- Have many shells fusing different elements; as more shells are formed, the star expands to a larger size and becomes a supergiant star;
- The star is very luminous and uses up it fuel quickly;

Death of a Star

- When a star runs out of fuel, its core no longer releases energy, it becomes a white dwarf, a neutron star, or a black hole;
- Giants that have had their outer parts drift out into space, leave behind the blue-white hot core – a white dwarf;
- A dying supergiant star can suddenly explode; the explosion is called a supernova; material that is left behind forms a neutron star.
- The remains of the most massive stars collapse into black holes; not even light can escape from a black hole.

It is not essential for students to know the internal dynamics of what goes on within the star at the various stages of life. Temperature data and life cycle time should be relative terms.
Time permitting, some basic study of constellation may spark student's interest, but it is not essential.

Assessment Guidelines:
The objective of this indicator is to *summarize* the life cycle of stars; therefore, the primary focus of assessment should be to generalize major points about the birth, life and death of stars.
In addition to *summarize* appropriate assessments may require students to:

- *interpret* diagrams that show varying aspects of a star's life cycle;
- *compare* the life cycles of stars of different mass; or
- *recall* the possibilities that could occur at the death of a star.